

WHAT IS CLAIMED IS:

1. A staged deionization system comprising:

a first and second deionization subsystems having a charging state for deionizing fluid and a discharging state for deionizing the respective deionization subsystems, wherein
in the charging state,

5 input ionized fluid having an ion concentration C is introduced in the first deionization subsystem wherein the concentration of the fluid is decreased by Δ_1 to a fluid stream having a concentration $C - \Delta_1$, and

the $C - \Delta_1$ fluid stream is introduced to the second deionization subsystem and is charged in second deionization subsystem by decreasing the concentration of the
10 fluid by Δ_2 to a deionized output fluid stream having a concentration $C - (\Delta_1 + \Delta_2)$, and wherein

in the discharging state,

flush fluid is inputted in parallel to the first deionization subsystem and second deionization subsystem, wherein ions that have built up in the first deionization
15 subsystem and second deionization subsystem are discharged.

2. A staged deionization system comprising:

N deionization subsystems represented by $k=1$ through N, each having a charging state for deionizing fluid and a discharging state for deionizing the respective deionization subsystem, wherein

5 in the charging state, N serially connected systems each decrease the concentration of input fluid initially having a concentration C by an amount of Δ_k at each stage resulting in an output deionized fluid stream having a concentration $C - \sum_{k=1}^N \Delta_k$, and wherein

10 in the discharging state, the N deionization subsystems are flushed in parallel with flush fluid having a concentration F, resulting in maximum discharged fluid concentrations of $F + \Delta_M$, where Δ_M is the largest value of the values Δ_k .

3. The staged deionization system as in one of claims 1 or 2, wherein at least one of the deionization sub-systems comprise flow through capacitors electrically connected to an electrical connection in the charging state and electrically shorted in the discharging state.

4. The staged deionization system as in one of claims 1 or 2, wherein fluid communication between input fluids, deionization systems, flush fluids, and discharge fluids is provided in the form of plumbing and valves configured and constructed to be reusable, and wherein the deionization systems are modular.

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